

TRANSFORMATION (5-6 MARKS)

DIFFICULTY ↓
CRAMMING ↑

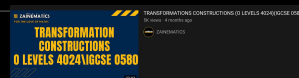
MATRIX TRANSFORMATIONS ARE OUT OF SYLLABUS NOW.

Tom & Jerry

- REFLECTION
- ROTATION
- TRANSLATION (DRAG)
- ENLARGEMENT
(ZOOM IN / ZOOM OUT)

FOR EVERY TRANSFORMATION MEMORIZE:

- 1) DESCRIBE
- 2) CONSTRUCTIONS (WATCH VIDEO)
- 3) ON-GRID SHORTCUTS.
- 4) MATRIX (NOT IN SYLLABUS ANYMORE)



REFLECTION

1) DESCRIBE: EQUATION OF LINE OF REFLECTION.

2) CONSTRUCTIONS: (video)

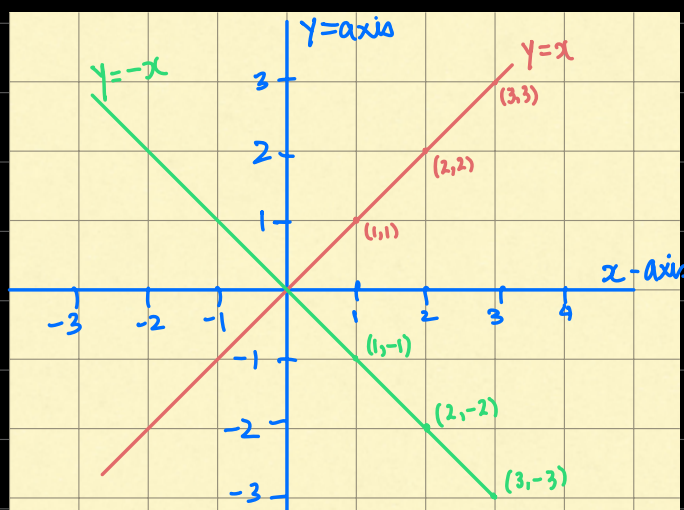
A' means Image of A

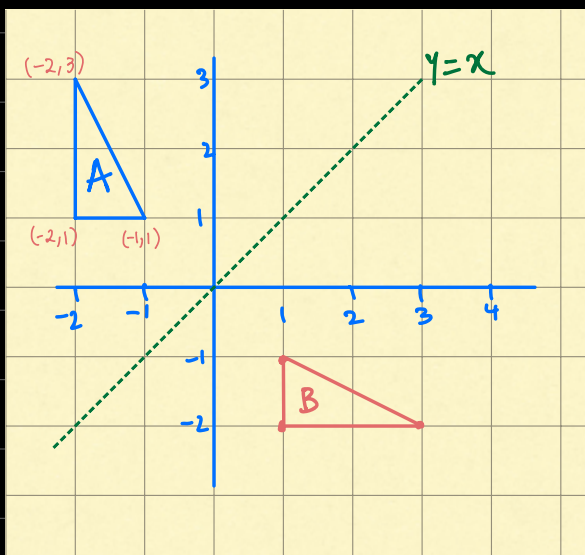
HOW TO FIND LINE OF REFLECTION:

CONSTRUCT A PERPENDICULAR BISECTOR BETWEEN
OBJECT AND IMAGE USING COMPASS.

3) ON-GRID SHORTCUTS:

	$A(1, 3)$
→ Reflection in x -axis, change y sign	$A'(1, -3)$
→ Reflection in y -axis, change x -sign	$A'(-1, 3)$
→ Reflection in $y=x$, swap both places change no sign.	$A'(3, 1)$
→ Reflection in $y=-x$, swap both places change BOTH sign.	$A'(-3, -1)$

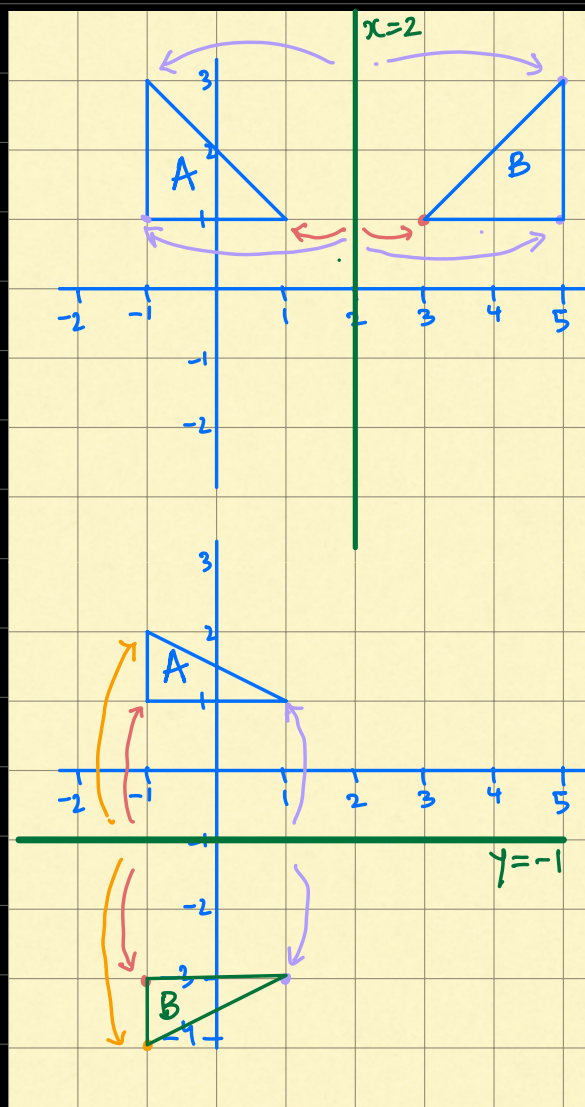




Reflect $\triangle A$ in line $y=x$. Label the image B.

→ swap places, change NO sign.

$(-1, 1)$	$(-2, 1)$	$(-2, 3)$
↓	↓	↓
$(1, -1)$	$(1, -2)$	$(3, -2)$



Q. $\triangle A$ is mapped onto $\triangle B$ by a reflection in line $x=2$. Draw and label $\triangle B$.

Q. $\triangle A$ is mapped onto $\triangle B$ by a reflection in $y=-1$. Draw and label $\triangle B$.

ROTATION

- 1) DESCRIBE :
 - (a) Centre of Rotation
 - (b) Angle of Rotation
 - (c) Direction of Rotation

2) CONSTRUCTIONS (video) (V.V.IMP) ←

a) How to find centre of rotation:

Construct two perpendicular bisectors between object and image. Point where both perpendicular bisectors cut each other is centre of Rotation.

b) Finding image through construction:

You will be required to rotate objects by angle which is multiple of 90 only.

3) ON GRID SHORTCUTS:

	$A(1, 3)$
Rotate 90° cw, swap both places change y-sign.	$A'(3, -1)$
Rotate 90° Acw, swap both places change x-sign.	$A'(-3, 1)$
ROTATE 180 degree, Just change signs	$A'(-1, -3)$

ROTATION

IF CENTRE OF ROTATION IS $(0,0)$

YOU ARE ALLOWED TO APPLY SHORTCUTS DIRECTLY.

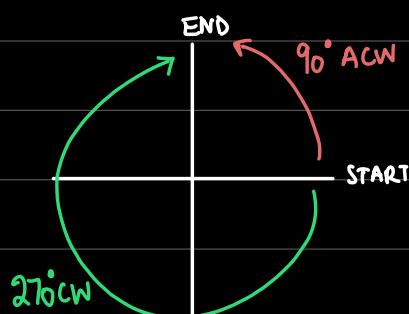
IF CENTRE OF ROTATION IS NOT $(0,0)$

THREE STEP PROCESS.

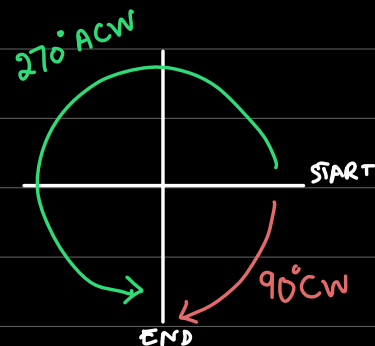
- 1- SUBTRACT CENTRE
- 2- APPLY SHORTCUT
- 3- ADD CENTRE.

IF ANGLE OF ROTATION IS NOT 90°CW , 90°ACW , 180° THIS IS DONE BY CONSTRUCTION. IT IS INCLUDED IN THE VIDEO. (NOT IN SYLLABUS NOW)

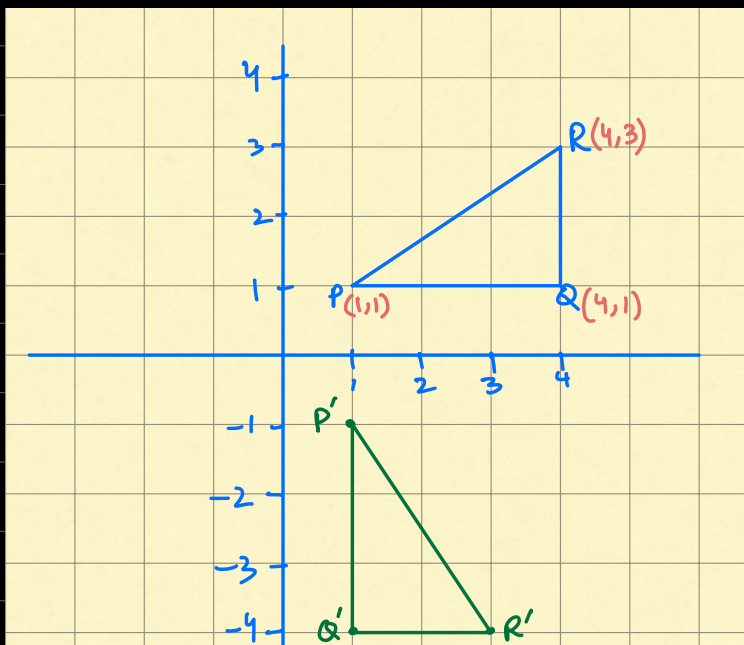
WE DO NOT DEAL WITH ANGLES IN 270°



$270^\circ\text{CW} \longrightarrow 90^\circ\text{ACW}$

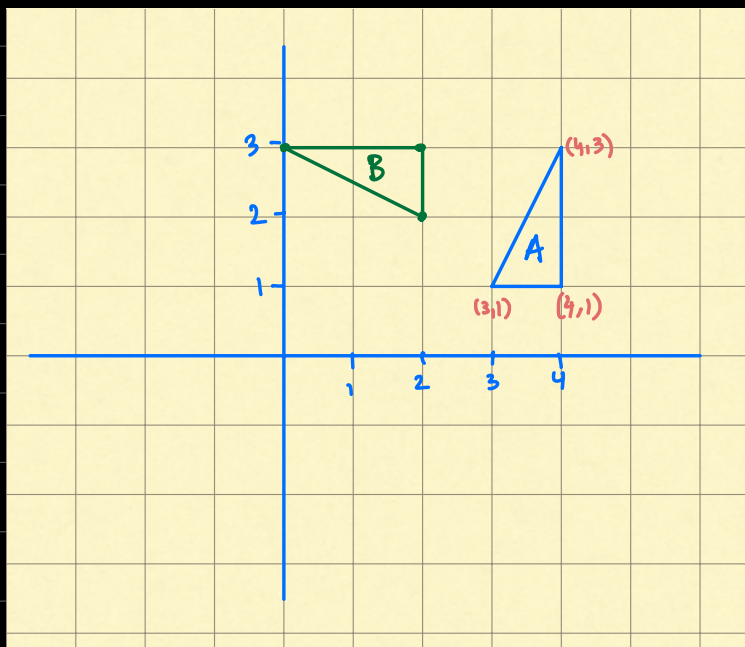


$270^\circ\text{ACW} \longrightarrow 90^\circ\text{CW}$



Q Rotate $\triangle PQR$
 90° CW about
 centre $(0,0)$
 Label the image
 as $\triangle B$
 we can use shortcuts directly.
 Swap places, change y sign.

$P(1,1)$	$Q(4,1)$	$R(4,3)$
↓	↓	↓
$P'(1,-1)$	$Q'(4,-1)$	$R'(4,-3)$



Q Rotate $\triangle A$
 90° ACW about
 centre $(2,1)$
 Label the image
 as $\triangle B$
 you cannot use
 the shortcut
 directly.

Object	$(3,1)$	$(4,1)$	$(4,3)$
Subtract centre	$(2,1)$	$(2,1)$	$(2,1)$
	$(1,0)$	$(2,0)$	$(2,2)$

Apply Shortcut.

Swap places, change x.

ADD Centre

Image.

↓

$(-0, 1)$

$(2, 1)$

$(2, 2)$

↓

$(-0, 2)$

$(2, 1)$

$(2, 3)$

↓

$(-2, 2)$

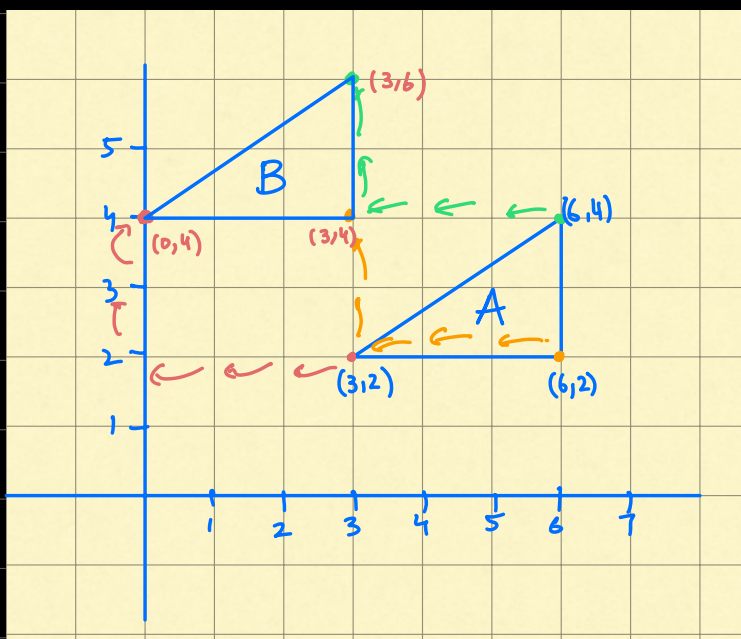
$(2, 1)$

$(0, 3)$

TRANSLATION (DRAG)

DESCRIBE: TRANSLATION VECTOR

$$T = \begin{pmatrix} x \\ y \end{pmatrix} \begin{matrix} \xrightarrow{+} \text{RIGHT} / \text{LEFT} \\ \xrightarrow{+} \text{UP} / \text{DOWN} \end{matrix}$$



ΔA maps onto ΔB after a translation $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

On the diagram
Draw and label ΔB .

$\begin{pmatrix} -3 \\ 2 \end{pmatrix} \rightarrow 3 \text{ boxes to left}$
 $\begin{pmatrix} -3 \\ 2 \end{pmatrix} \rightarrow 2 \text{ boxes up}$

$$\text{OBJECT} + \text{TRANSLATION VECTOR} = \text{IMAGE}$$

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 6 \\ 2 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 6 \\ 4 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$$

ENLARGEMENT

ZOOM IN - ZOOM OUT

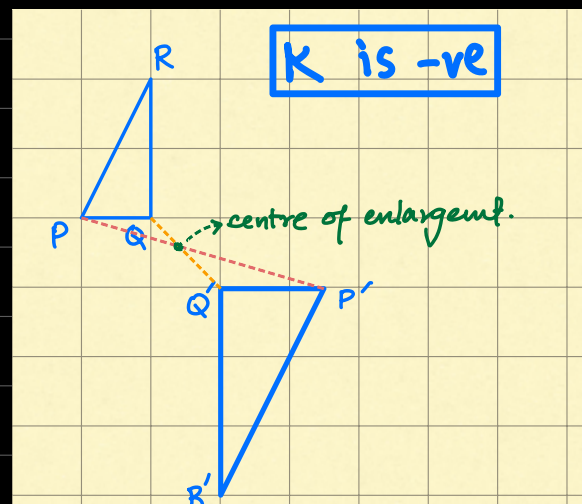
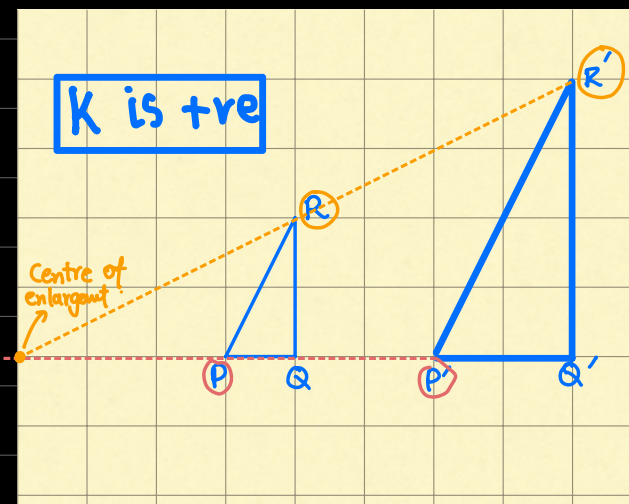
1- DESCRIBE

(a) Centre of enlargement

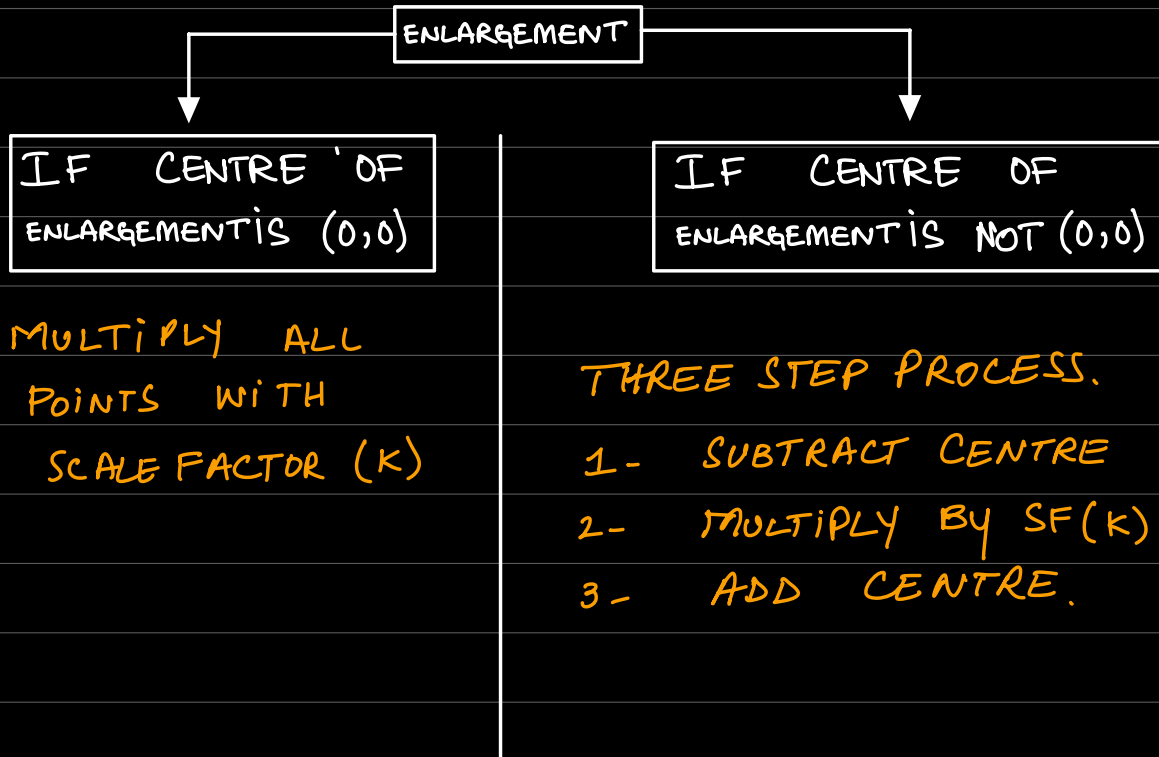
(b) Scale factor (K)

2. CONSTRUCTIONS

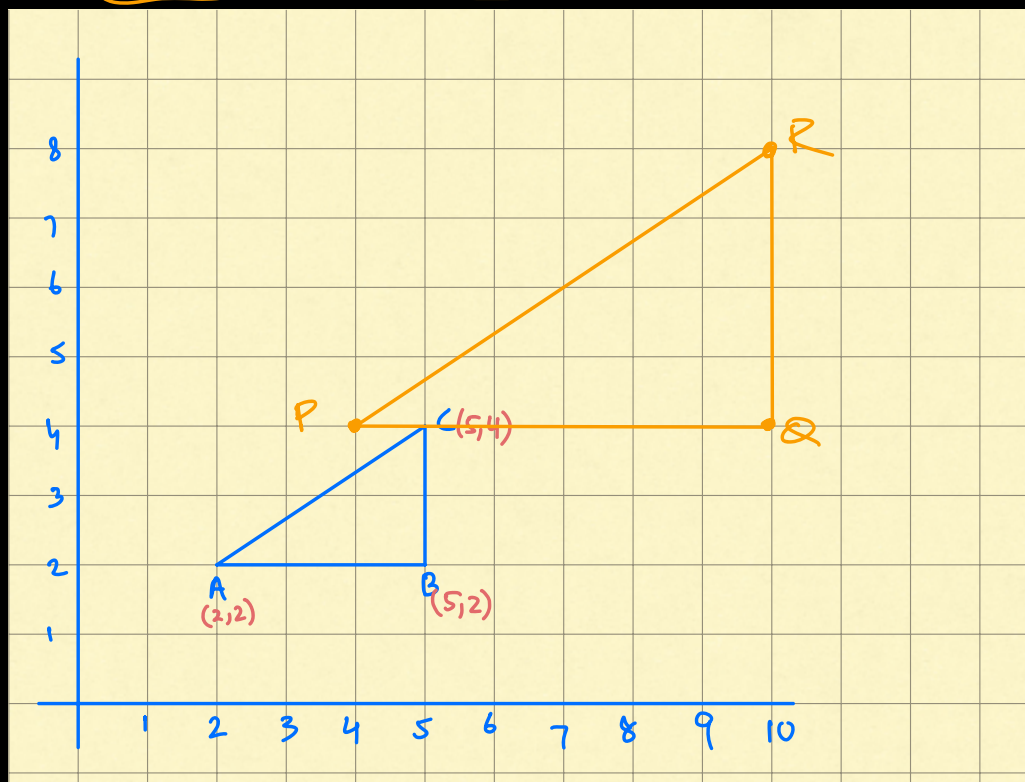
HOW TO FIND CENTRE OF ENLARGEMENT:



3- ON GRID WORKINGS.



Q: $\triangle ABC$ maps onto $\triangle PQR$ after an enlargement with centre $(0,0)$ scale factor 2. Draw $\triangle PQR$.



$$A(2,2)$$

$$\times 2$$

$$A'(4,4)$$

$$B(5,2)$$

$$\times 2$$

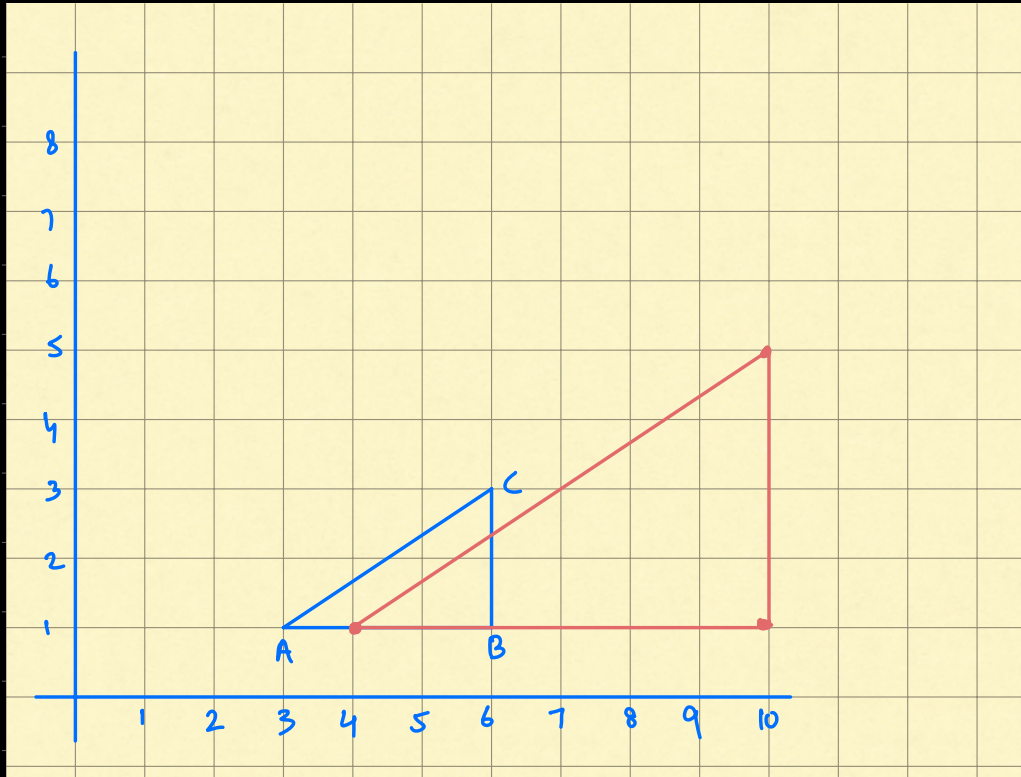
$$B'(10,4)$$

$$C(5,4)$$

$$\times 2$$

$$C'(10,8)$$

Q) Enlarge $\triangle ABC$ with centre $(2,1)$ Scale factor 2.
Draw and label image as $\triangle P$.



Now we cannot multiply with scale factor directly.

Objects	A(3,1)	B(6,1)	C(6,3)
Subtract Centre	(2,1)	(2,1)	(2,1)
	(1,0)	(4,0)	(4,2)
Multiply by SF	$\times 2$	$\times 2$	$\times 2$
	(2,0)	(8,0)	(8,4)
Add Centre	(2,1)	(2,1)	(2,1)
Images	(4,1)	(10,1)	(10,5)

SCALE FACTOR (K)

$$K = \frac{\text{Image length}}{\text{Object length}} = \frac{6}{2} = +3$$

$$K = \frac{\text{Image to centre distance}}{\text{object to centre distance}} = \frac{3}{1} = +3$$

$$K^2 = \frac{\text{Image Area}}{\text{Object area}}$$

$$K^2 = \frac{9}{1}$$

$$K^2 = 9$$

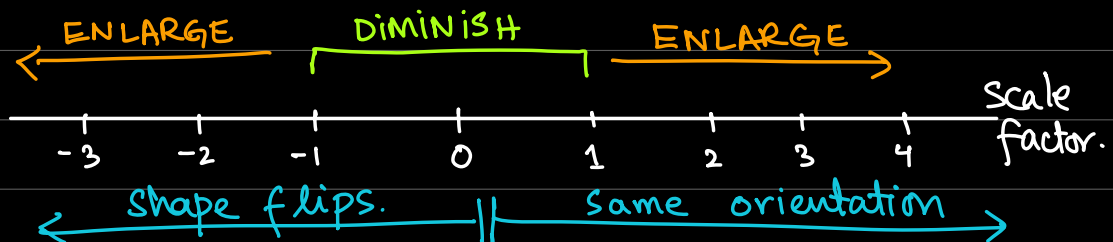
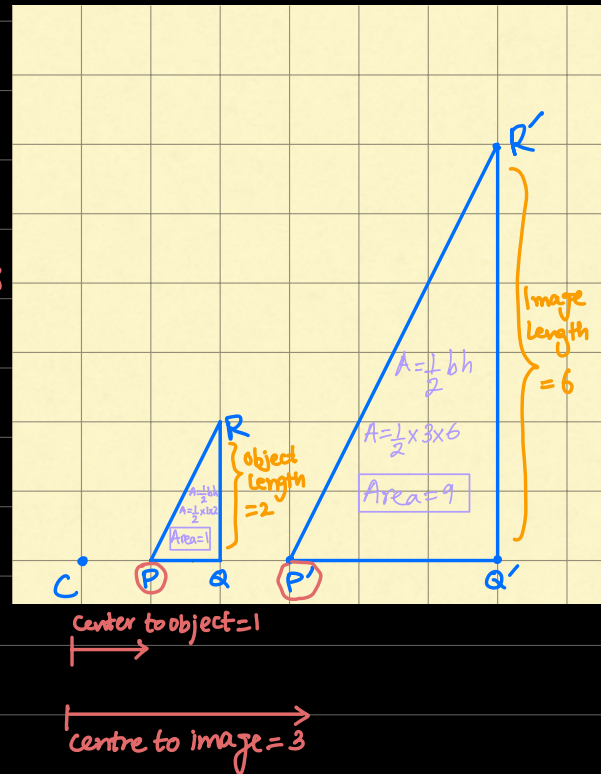
$$K = \pm\sqrt{9}$$

$$\boxed{K = 3} \text{ or } K = -3 \text{ (reject)}$$

accept

IMP IF K is +ve, centre of enlargement is on one side of both object and image.

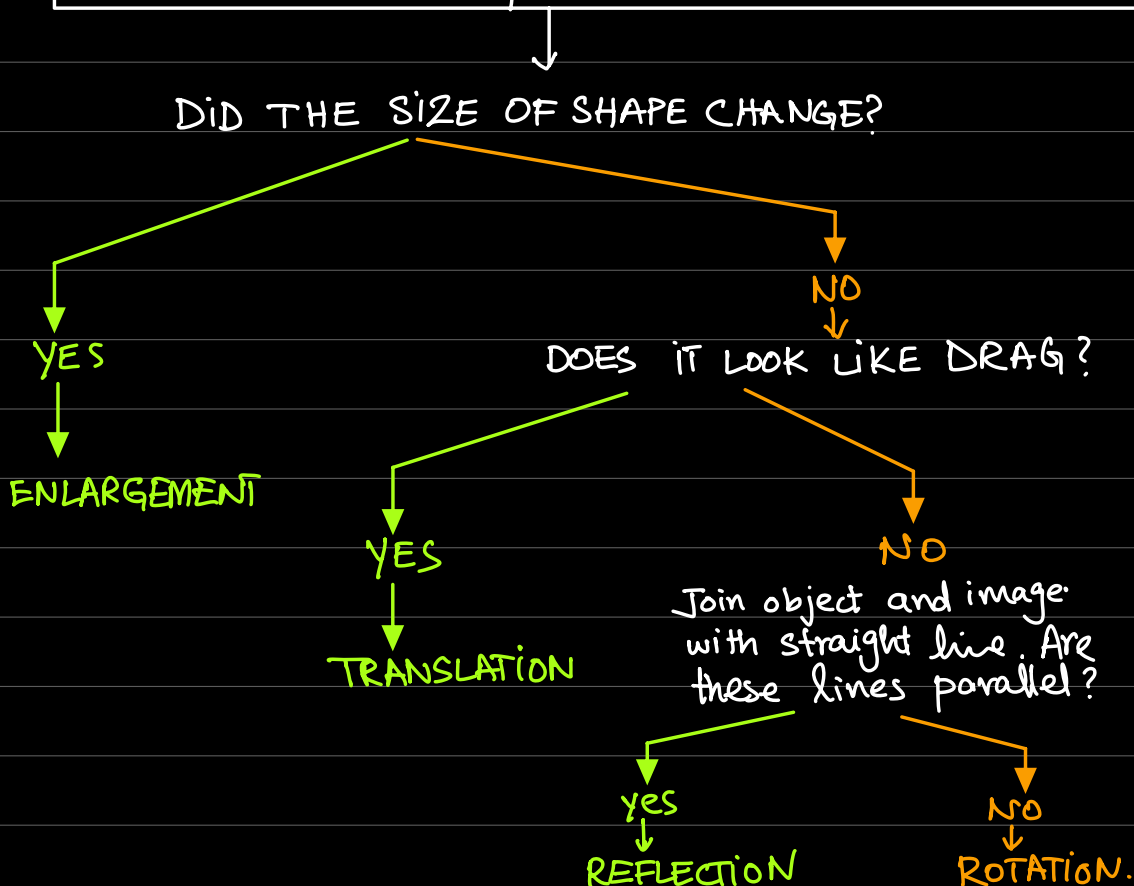
IF K is -ve, centre of enlargement is somewhere between object and image.



DESCRIBE

1- REFLECTION	EQUATION OF LINE OF REFLECTION
2- ROTATION	1- Centre 2- Angle 3- Direction
3- TRANSLATION	Translation vector $\begin{pmatrix} x \\ y \end{pmatrix}$
4- ENLARGEMENT	1- Centre 2- Scale factor (k)

HOW TO IDENTIFY AMONG TRANSFORMATIONS



WELL!
%
DONE